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B.Sc. (Hons.)/III

STATISTICS—·Paper XXII

(Design of Experiments)

(Admissions of 1999 and onwards)

Time : 2 *Hours*   *Maximum Marks* : 38

(*Write your Roll No on the top immediately on receipt of this question paper.*)

Attempt *four* questions in all,

selecting *two* from each Section.

Section I

1.   (*a*)   What do you understand by uniformity trials ?

     (*b*)   Discuss the shapes and sizes of the plots and blocks.

     (*c*)   Compare RBD with split plot design.   3, 3, 3½

P.T.O.

2.　In the Latin square design :

A	B	C	D
B	A	D	C
C	D	A	B
D	C	B	A

Observation in the second row and second column is missing. Derive the analysis of this design. Also, obtain the expressions for the standard error of the difference between two estimated treatment means.　　　　9½

3.　(a)　For a split plot design, derive the expected mean squares due to whole plot treatments and interaction between whole plot and subplot treatments.

　　(b)　Derive the relative efficiency of the LSD with the RBD.　　　　6, 3½

Section II

4.　(a)　Derive a necessary condition for the existence of a symmetric BIBD with even number of treatments.

(b) Given a BIBD with treatments a, b, c and d :

$$a \quad a \quad b \quad a$$

$$c \quad b \quad c \quad b$$

$$d \quad c \quad d \quad d \quad \cdot$$

where the columns denote the incomplete blocks. Write down its :

(i) Complementary.

(ii) Residual.

(iii) Derived, and

(iv) Dual.

BIBDs along with their parameters.   3½, 6

5. (a) Derive the contrasts due to main effects and interaction effects in 3^2 factorial experiment.

(b) Construct a system of partial confounding for a 2^3 factorial experiment in blocks of size 4 with 8 blocks, so that at least partial information can be obtained about the 2 and 3 factor interaction components and complete information about all the main effects.   5½, 4

6. Obtain the treatment combination of a 2^{5-2} design using $I = ABD$ and $I = BCE$ as design generators. Write down the alias structure and resolution of this design. If, in the plus and minus table of the treatment combinations obtained. signs in column A are reversed. write down the resulting treatment combinations. Further, if these 16 treatment combinations are combined, identify the resulting design. Write down its alias structure and resolution.   9½